BMC Neuroscience

Poster presentation

iBrain: a simulation and visualization tool for activation of brain areas on a realistic 3D brain image

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from Sixteenth Annual Computational Neuroscience Meeting: CNS*2007
Toronto, Canada. 7–12 July 2007

Published: 6 July 2007

BMC Neuroscience 2007, **8**(Suppl 2):P13 doi:10.1186/1471-2202-8-S2-P13

Introduction

Many computer models have been developed to simulate a neuron, neural networks, and activation of brain areas aimed at the elucidation of mechanisms of brain functions. In this track there is one clear direction of modeling from a single cell to the whole brain [1]. We developed a simulation and visualization tool, "iBrain", by which we could construct, simulate and visualize a model of the transition of brain activation on a realistic brain anatomical atlas.

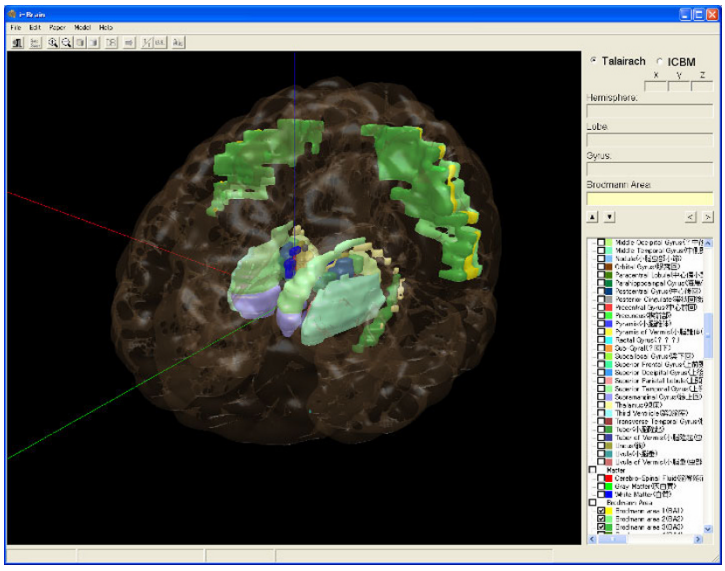

Figure 1
An example of Brodmann area display in "iBrain".

Methods

The modeling and simulation parts were constructed by modifying the software tool for a biological cell, "A-Cell". Users can construct a Brodmann area-level model through A-Cell like GUI. The simulation algorithm is the same as that in A-Cell. In the visualization part, an anatomical atlas of human brain was constructed from the data of "Talairach Daemon Client" superimposing them on the human brain MRI volume of "ICBM template" from LONI. This allows users to see the shape and position of various anatomical regions of the brain from mm to hemisphere resolution in the realistic 3D brain (Fig. 1). The activation patterns calculated in the simulation are visualized on this brain image.

Results

To test the simulator, we tried to reproduce the activation patterns of a human's word processing which were measured by MEG (magneto-encephalogram). The reproduced patterns were roughly matched to the patterns from the experiment and we could see them visually on the iBrain.

Conclusion

Simulation and visualization of spatio-temporal activation of brain areas on a realistic 3D brain image can be realized by iBrain. We believe this software can help us to understand the brain function at macroscopic level.

References

1. Markram H: **The blue brain project.** *Nat Rev Neurosci* 2006, **7:**153-160.